THE IRREGULAR OPERATION OF THE BITUMINOUS COAL INDUSTRY

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Fact of Irregular Operation

The bituminous coal mines of the United States have a developed capacity and a present labor force far in excess of that required to supply the demand.[1] In consequence the capital and labor engaged in the industry are idle a large part of the time. During the last thirty years the mines have been idle an average of 93 working days in every calendar year.[2] Even in 1918, the year of maximum production, they lost 59 days, or 20 per cent of the full working time.[3] The condition is apparently not improving for in 1919 it is estimated that the mines were idle 111 days, and the record for 1920 will also be unsatisfactory. This condition is no fault of the operator, who is aware of its results but is powerless to prevent it. The causes are rather the seasonal nature of the demand, irregularities in the supply of cars and of labor, and no less important, the nature of the resource and the competitive conditions surrounding the industry. Strikes, in ordinary years, have been only a minor cause of lost time.[4]

The loss of time is least in the fields of the Appalachians and of the Southern Rocky Mountains, and most acute in the Mississippi Valley.[5] The regions in which the losses are greatest have shown a tendency to become union territory.

The effects of irregular operation are injurious to all concerned in producing, transporting, or consuming coal. To the miner it means loss of earning power; it begets in him irregular habits, and it is a contributing cause to the absenteeism and the large labor turnover complained of by the operator. To the mine owner it means high costs per ton,[6] administrative difficulties, and mechanical troubles in the mine

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1 Except where otherwise specified the statements in this paper refer to the bituminous coal industry alone. The conditions in anthracite mining are entirely different.

2 For a statistical analysis of irregularities in operation of coal mines, see George Otis Smith and F. G. Tryon, *Fluctuations in Coal Production,—Their Extent and Causes; Mining and Metallurgy,* Number 159, Section 3, pp. 9-28, March, 1920.

3 *Idem,* p. 10.

4 *Idem,* p. 26.

5 *Idem,* pp. 19-20.

6 U. S. Fuel Administration, *Report of Engineers' Committee,* p. 61, 1919. Also Smith and Tryon, *op. cit.,* pp. 21-22.

resulting from cessation of work. To the railroads it means a seasonal load and loss of revenue in spring and summer when normally, as in 1919, large numbers of coal cars are idle. To the public it means high-cost coal, for the labor and capital engaged in the industry must be paid for the 93 days on which they are idle in each year as well as for the 215 days on which they work. It also contributes to the waste of our underground resources that results from the present regime of intense competition.

Statistical analysis discloses three distinct types of fluctuations in production: (1) secular, (2) seasonal, and (3) daily. These will be discussed in turn.

1. *Secular fluctuations.* The fluctuations that accompany business depression, of which the severest have occurred in 1893-97, 1904, 1908, 1914, and 1919, are profound while they last and are beyond remedy by the coal industry itself. Only a sixth of the time lost in the past 30 years has been due to this cause, however. If the maximum effect possible is allowed for these secular fluctuations there is still a residue of lost time—on the average 78 days per year—which must be due to other factors.[7]

1890 — 82	1900 — 74	1910 — 91
1891 — 75	1901 — 83	1911 — 97
1892 — 89	1902 — 78	1912 — 85
1893 — 104	1903 — 83	1913 — 76
1894 — 137	1904 — 106	1914 — 113
1895 — 114	1905 — 97	1915 — 105
1896 — 116	1906 — 95	1916 — 78
1897 — 112	1907 — 74	1917 — 65
1898 — 97	1908 — 115	1918 — 59
1899 — 74	1909 — 93	1919 — 111*

*estimated.

2. *Seasonal fluctuations.* Differences in rates of consumption in summer and winter give a distinct seasonal rhythm to the demand for coal.[8] In a normal year, such as 1913, the rate of production is lowest in April and highest in November. If the annual average rate be taken as 100, the rate in April in a normal year is about 83 and the rate in November about 115.[9] The productive capacity required during the month of maximum demand is thus from 35 to 40 per cent greater than in the month of minimum demand. In the "even" years, when the biennial wage agreements are negotiated, the normal April depression is ac-

[7] Smith and Tryon, *op. cit.*, p. 12. The average number of working days lost per year at bituminous coal mines, as shown by the records of the U. S. Geological Survey, has been as follows:

[8] *Idem*, p. 27.

[9] *Idem*, p. 14. The seasonal fluctuations in the prewar years were as follows, expressing the average rate per working day for each month as a relative, the average for the year being 100:

Month	"Even years"		"Odd years"	
	1914	1916	1913	1915
January	113	114	104	103
February	108	111	99	85
March	123	99	92	82
April	68	82	84	81
May	80	88	89	83
June	88	89	96	91
July	96	94	96	95
August	106	97	103	102
September	114	99	107	114
October	106	105	110	118
November	98	114	115	124
December	101	108	103	122

centuated by labor disturbances, in anticipation of which a peak of forced buying occurs in March.

The seasonal variation in demand was marked during the prewar years, 1913-16. It was obscured in 1917 and 1918 by the artificial conditions of the war period but recurred with heightened effect in 1919.[10] The reason we had no slump in demand in the spring and summer of 1920 was that we inherited a deficit of 26,000,000 tons from the strike of November-December, 1919. The seasonal variation may therefore be expected to reappear.

These statements are based on averages for the entire country from which the averages of individual districts depart widely. In some fields of the northern Appalachians, for example, the shipments to the Northwest by way of the Lakes, which must be made during the season of navigation, flatten the curve of demand or even transform the summer slump into a gentle peak.[11] It is in the Middle West that the seasonal fluctuations are sharpest. In Illinois, for example, the production in November, even in years of no wage negotiation, is twice as great as in April.[12]

3. *Daily fluctuations.* Even within the week, in times of active demand, there is a distinct rhythm from day to day. Car supply is best on Monday and becomes less and less satisfactory as the week progresses. Production on Saturday is therefore likely to be 15 per cent less than on Monday. The daily fluctuations are not the least significant of the irregularities which beset coal-mine operation, for they indicate that even at times of maximum demand the mines do not work full time.[13]

[10] *Idem,* p. 13.
[11] *Coal Age,* vol. 17, p. 1033 ff., May 20, 1920.
[12] Smith and Tryon, *op. cit.,* p. 17.
[13] *Idem,* p. 16.

Mine Capacity Inflated Far Beyond Even Maximum Week's Output

We have thus noted not only that there are years when production is below that of the maximum year, seasons in the year when it is below that of the maximum season, and weeks in the maximum month when it is below that of the maximum week, but even that there are days within the maximum week when it is below that of the maximum day. In fact, there has probably never been a day in recent years when all the mines and all the miners were working at once, although this perfect adjustment of operation to capacity was nearly reached on the Monday of the last week before the strike of November, 1919. The best working time ever attained in a six-day week was 86.8 per cent of full time (48 hours), in July, 1918.[14] Early in December, 1920, when production was very heavy, the mines averaged less than 75 per cent of full time. The estimated present capacity of the mines and working force is at least 16,000,000 tons a week, yet the maximum ever produced in a single week was 13,146,000 tons.[15] In other words, our mine capacity and labor force are not only greater than the average need but they are *much greater than the maximum need.* To borrow a phrase from power engineering, our mine plant not only has a bad load factor, but it is much larger than is needed to meet the *peak load.*

So great an economic waste challenges attention. Before considering, however, the measures which have been proposed to prevent it, the causes underlying the inflation of capacity beyond even maximum requirements must be understood.

The area underlain by coal in the United States is enormous (458,000 square miles),[16] and a great part of the coal-bearing land east of the Rockies had been taken up in small tracts for farming or for other purposes before its value for coal was known. In the east it is becoming somewhat difficult to find a block of unoccupied coal land big enough to support a large new mine and with access to transportation, but until recently there was room for all comers. To suppress competition by buying up the reserves has therefore been impossible. In fact, the wide dissemination of ownership in itself has tended to stimulate development, for each possessor of coal-bearing land wishes to realize on his holding. The coal beds are generally thick, lie nearly flat, and are but little faulted. They are readily accessible from slopes, drifts, or shallow shafts. Under such conditions, although a large modern mine

[14] U. S. Geological Survey, *Weekly Coal Report No. 54,* p. 2, July 27, 1918.

[15] Week ended October 25, 1919. U. S. Geological Survey, *Weekly Coal Report No. 121,* p. 1, November 8, 1919.

[16] M. R. Campbell, *The Coal Reserves of the United States,* in *The Coal Resources of the World,* vol. 2, p. 538, 1913.

may involve an investment of capital running into millions, it has been possible to open up a small mine at low initial expense. The capital required can often be raised locally, partly because of the "jingle fallacy," which has deceived so many investors in mining enterprises—the fallacy of thinking that 6 per cent on a mining stock is the same as 6 per cent on a mortgage and neglecting to write off the depletion. The nature of the resource has thus encouraged overdevelopment. In addition, transportation—no less important—has been guaranteed a new enterprise. The factor limiting output in a time of high prices has usually been car supply; at such a time anybody with cars to load can sell coal. No matter how overburdened the railroad serving the coal field may be, it is obliged by law to put in a siding and supply cars for the new operation.[17] The opening of the new mine does, indeed, dilute the car supply of the entire region, but the operator can count on his pro rata share of the cars available.

The factors necessary to new development—coal lands, capital, and transportation—have therefore been easy to bring together. The necessary incentive has been supplied by the periodic recurrence of high prices. Coal is a necessary of life for which substitution on a significant scale is impossible.[18] The demand for it is therefore highly inelastic. Moreover, when a scarcity exists the bidding for emergency supplies is concentrated on the limited margin of "free coal," that is, coal not under contract. No one knows just how much of the output is under contract and how much available for spot purchase, but normally, over the country as a whole, the proportion of spot coal is perhaps 25 per cent.[19] The moment production is interfered with, however, the margin of spot coal shrinks. At the same time the number of persons who want to buy spot coal increases, for many who thought themselves protected by contracts find their contract deliveries curtailed and have to enter the spot market. The interaction of these two principles—the inelasticity of demand and the contraction of the spot tonnage in times of scarcity—bring it about that even a slight maladjustment between supply and requirements may produce a spectacular rise in the spot price, such for example as took place in the summer of 1920.[20] These higher prices in times of active demand were apparently

[17] 34 Statutes at Large, 584.

[18] F. G. Tryon, *The Fuel Oil "Menace," Notes on the Substitution of Oil for Coal during Years 1919-1920: Black Diamond,* vol. 65, p. 506, November 20, 1920.

[19] C. E. Lesher, *Prices of Coal and Coke,* War Industries Board Price Bulletin No. 35, *History of Prices During the War,* p. 21, 1919. Also United States Bituminous Coal Commission, *Majority and Minority Reports to the President,* p. 25, 1920.

[20] National Coal Association, *The 1920 Soft Coal Shortage, Letter of George Otis Smith to Senator Walter E. Edge, dated December 13, 1920,* p. 6, Washington, D. C., 1921.

the prime incentive to the new development which has kept mine capacity so far in excess of possible requirements. Although in comparison with the war years prices before 1916 seem modest indeed, the spot price would rise almost every year to attractive levels during the limited period of brisk demand,[21] and occasionally, as after the anthracite strike of 1902, even contract prices would rise well above the cost of production.

The inflation of mine capacity in times of high prices has been strikingly demonstrated in the last five years. Since 1915, when the spot price began to rise sharply in response to the war-time demand, there has been an extraordinary increase in capacity. In 1915 the annual capacity of the soft coal mines was about 675,000,000 tons.[22] Today it is certainly 800,000,000 tons, and there is evidence pointing to a figure of 900,000,000 tons. The increase in five years has therefore been between 125,000,000 and 225,000,000 tons, or between 19 and 33 per cent. The increase has been particularly marked during the last twelve months. It is not due alone to the opening of new wagon mines or the reopening of old mines, long abandoned. It means also a number of large new workings and heavy investments in new development work, new equipment, and new mining machines at properties already established. A significant change has been the increase in the number and output of steam-shovel strip pits. The aggregate effect of these influences on capacity has been great, and the bituminous industry was probably never more heavily overdeveloped than it is today.

The lure of occasional high prices was what enticed new companies to enter the field. When they were once in, other forces compelled additional development. The necessity of pushing development in order to be able to meet carrying charges on extensive investments in coal lands was pointed out years ago by Walker.[23] Either for speculative purposes or to anticipate their competitors, many companies have acquired coal lands far in excess of the reserve they need for their mines. The recurring interest on these investments must be paid in cash, and often the only way to raise the cash is to open more mines and sell more coal. Every new mine means dilution of the demand and of the car supply in times of shortage, and consequently a slight decrease in the working time at the mines the company is already operating. But the company

21 Lesher, *op. cit.*, p. 31.

22 C. E. Lesher, *The Distribution of Coal and Coke,* U. S. Fuel Administration, *Report of the Distribution Division,* Part I, p. 19, 1919.

23 Francis Walker, *Cause of trusts and some remedies for them,* in *Papers and Discussions of the Twenty-Second Annual Meeting of the American Economic Association,* 1909, pp. 196-7.

knows that the new mine will be allotted its share of the available cars and that most of the dilution will be passed on to its competitors. Under these conditions the tendency to new development proceeds as inevitably as the physical process of osmosis.

These factors combine to inflate mine capacity. At this point another factor enters in which impels the owner to operate his property as near to its capacity as he can, even when the price is low. As Walker further pointed out, the individual operator can not curtail his output without increasing his costs, and when the margin of profit is small he dare not increase his costs.[24] The extra amount of coal produced by him has "much less effect in depressing the market price than in diminishing his own costs," and he is therefore compelled to continue to sell coal on the narrowest margin, or perhaps at a loss.

The picture is not complete without a reference to the evil results of overdevelopment and overproduction when the price is deflated. The abounding prosperity enjoyed by the industry during the war years and 1920, when a combination of circumstances kept prices high, are likely to make us forget the conditions of 1914-15. At that time the market was depressed, and competition forced prices often below the cost of production. Rather than abandon his mine, many an operator sold coal at prices barely above the immediate cost in labor and materials, and below cost when reasonably computed. Coal-mine credit was poor and many companies in the hands of receivers. There is abundant testimony that most of the time before the war the industry was operating on a very narrow margin of profit. It is such competition as this that makes inevitable the wasteful methods of mining which in many of our fields leave half the coal behind in the ground in a manner that renders its ultimate recovery very unlikely.

Measures Proposed To Overcome Irregular Operation

To eliminate the waste involved in irregular operation is thus an economic problem of real importance. Obviously the magnitude of the loss cannot be accurately determined, but the writer hazards the opinion that at present levels of wages and costs it constitutes a tax on the consumer in the neighborhood of a million dollars per working day. The bituminous operators are not unmindful of their responsibility and may take heart from the fact that the anthracite industry has successfully combatted the evil. In the nineties and the first decade of the twentieth century, working time in the anthracite region of Pennsylvania was even less satisfactory than in the bituminous fields. By offering summer discounts in prices, by constructing storage yards, and by other devices the anthracite operators have done much to flatten

[24] *Idem*, pp. 295-6.

the curve of demand and have raised their working time to a point far above that reached by the bituminous industry.

Various measures designed either to stabilize the demand for bituminous coal or to regulate competition and overdevelopment have been proposed, and will be discussed in turn. The writer has no new solution to offer and no concern with any of the measures advanced by others beyond a statement of their merits and defects.

The 30-hour week. One of the arguments advanced by the United Mine Workers in favor of the 6-hour day and the 5-day week has been that this arrangement would limit the amount of coal that could be produced in the season of brisk demand, and so force greater activity in the slack season.[25] Although this might be the immediate result, it is hard to see how the plan would in any way change the demand. Its first effect would be to cause high prices at the mines for coal for winter delivery. It would encourage new development and so would tend to make worse the very condition it is supposed to improve.

More cars. To the operator marketing his coal in times of high prices, nothing is more disappointing than the "car shortage" that is likely to prevail at such times. Dissatisfaction with existing transportation facilities takes two forms: (1) complaints of unequal distribution of the car supply, due to the practice of assigning cars, the use of private cars, etc.; and (2) complaints of general inadequacy of the transportation system, either through lack of sufficient cars, sufficient motive power, yard and track facilities, or any other cause which prevents cars from being placed and removed as fast as the mines are able to load them. With the first of these complaints we need not concern ourselves here. The disagreement over assigned cars is essentially a dispute between the operators and the railroads. It has no great influence on the working time of the industry as a whole, except indirectly as it may cause dissatisfaction among the workers in certain mines and thereby may breed strikes.

With regard to the second complaint, it is clear that at present the peak demand for cars is far in excess of the supply. Whenever the market is active, transportation tends to become the limiting factor in coal-mine operation, which is simply another way of saying that the mines are developed to a capacity far in excess of the car and track capacity. The adequacy of the present railroad equipment available for handling coal is discussed in Mr. Gutheim's paper. No doubt we need more cars. The point will bear emphasis, however, that merely in-

[25] *Increased Price of Coal, Hearings before a Subcommittee of the Committee on Interstate Commerce,* U. S. Senate 66th Congress, 1st Session, pursuant to S. Res. 126, Part I, p. 295, 1919. Also United States Bituminous Coal Commission, *Majority and Minority Reports to the President,* pp. 45-7, 83-4, 1920.

creasing the transportation facilities will not improve the working time at the mines over an extended period. More transportation will have no effect on the seasonal character of the demand for coal. In fact, unlimited transportation would tend to emphasize the inequality between spring and fall demand. Car shortage in time of active buying has been the sole influence depressing the peak of seasonal demand, the only thing that has kept us all from ordering our coal the week before we wanted to burn it. While car shortages have been of frequent occurrence, it is a curious fact that only in a few instances have they curtailed the consumption of coal. In the winter of 1917-18 consumers actually went without coal, the cause being unmistakably the failure of the railroads to provide cars for loading coal at the mines, or still more, to deliver coal already on wheels. But for the most part the effect of car shortages has been to limit the quantity of coal which could be produced in the fall and winter, thereby putting up the price and inducing many consumers to lay in a reserve supply in the spring and summer.

Furthermore, it is no less important to utilize the railroad plant steadily throughout the year than to provide regular employment for the mine plant. The investment in open-top cars alone is at least of the same order of magnitude as the investment in coal mining, and the share of the entire capital invested in the railroads of the country that is applied to hauling coal is probably much greater. To ask the railroads to spend money enough to give the mines a 100-per cent car supply in times of peak demand is to ask them to do the very thing the operators themselves are trying to avoid.[26]

The statement that a great increase in the number of cars and in transportation facilities will be of no benefit to the industry applies only to the industry as a whole; it may not apply in a particular locality. New cars under private operation of the railroads will, of course, mean new cars on particular lines, not on the railroad system considered as a whole. New cars on the Chesapeake & Ohio Railroad may largely benefit the operators along that road, making it possible for them to participate in larger degree in supplying the country's demand for coal, but what the Chesapeake & Ohio operators gain other operators on other railroads lose. Let no one suppose that by indiscriminately increasing the number of cars and the carrying capacity of the railroads, the problem of irregular operation in the coal industry will be solved.

Dovetailing work with other seasonal industries. It is frequently urged that mine workers may find employment in other occupations during periods of idleness, and in fact, there is a slight seasonal migra-

[26] Smith and Tryon, *op. cit.*, p. 22.

tion of men to and from the mines. The evidence submitted to the Bituminous Coal Commission on this point, however, failed to indicate that the opportunities for such transfer of labor from mine to farm or factory are extensive. The most promising field for the practice would appear to be the Middle West, where many of the mines are near farming regions. If the mines were closed during the entire summer, the miners might indeed seek other employment, but instead they continue to work two or three days a week. Mining on an extensive scale, at least, is of necessity a continuous operation. Unless roof and bottom are unusually stable any long interruption to operation invites disaster. Furthermore, in the Appalachian region, where the greater part of the coal is produced, most of the mining towns are far from other industries. The typical mining settlement of West Virginia is in a narrow mountain valley, where space for even gardening around the houses of the employees is scanty. The proposal is suggestive enough to deserve careful study, but it appears to offer no adequate solution for intermittency of employment at the mines.

Storage of coal. It has been frequently pointed out that as long as consumption is seasonal, and in a climate like that of North America it must always be seasonal, the only way to insure steady working time at the mine is to provide adequate storage facilities at some point between the coal in the ground and the furnace of the consumer.

The extension of the practice of storage turns upon a technical problem, the feasibility of storing coal on a large scale without spontaneous combustion and undue losses through escape of volatile matter or physical degradation. The coals of the Appalachian region can generally be stored more easily than those of the Mississippi Valley. As to the feasibility of stocking the former there can be no doubt, for they are stored by the Northwestern Coal Dock operators in enormous quantities under trying conditions. There is a widespread belief that the coals of the Mississippi Valley—Illinois, Indiana, Western Kentucky, and the fields from Iowa to Texas—will not endure storage. Careful investigation by the engineers who have devoted most attention to this subject, however, indicates that with due precautions these coals also may be stored.[27] Of course the precautions necessary cost money, and to be economically practicable, must be offset by beneficial results.

The most convincing demonstration of the practicability of storing western coal in large quantities is seen in the fact that on the day of the armistice consumers had on hand 63,000,000 tons of soft coal, an amount sufficient for six weeks and three days' supply. Millions of tons

[27] H. H. Stoek, *Storage of Bituminous Coal: Mining and Metallurgy,* Number 159, Section 3, p. 29, March, 1920.

of this coal were mined in the Middle West.[28] In fact, by order of the Fuel Administration Appalachian coal had been zoned out of most of the Mississippi Valley except for small quantities moving under permit. Although the purchasers of this western coal reported many fires, only a small part of it burned up or blew away, and the carry-over into 1919 was so heavy as to depress the market for months thereafter. Western coal has been stored in quantities sufficient to stabilize the demand. What was done during the war can be done again, if only the necessary incentive is provided.

Storage at the mine. It is frequently urged by those who are unfamiliar with mining conditions in America that stocks of coal should be maintained at the mouth of the mine. This is, indeed, the prevailing practice in parts of Belgium and other countries on the Continent, but under the conditions that exist in the United States the practice would be of value only in evening up the small irregularities in operation during a given week. It would have no influence on the seasonal movement of coal from mine to consumer, and would therefore leave untouched one of the most glaring ill effects of the present system—the unequal load upon the railroads. Neither would it furnish a reserve for the protection of the consumer against a breakdown in transportation, and experience during the war has shown that actual suffering and the closing down of plants are due more to delays in the delivery of loaded coal than to diminution in the rate of output at the mines. So many consumers depend upon the mobile reserve of coal in transit that any interruption to normal movement on the railroads means a scarcity of coal. In addition to these facts the extra cost of putting the coal in storage and reclaiming it militates against storage at the mine. As someone has aptly put it, the cheapest place to store coal at the mine is underground in the bed.

Storage en route. Accumulations of coal may sometimes be kept advantageously at points along the way from mine to place of use. Examples of this practice are seen in the great storage yards that were constructed years ago by the producers of anthracite. These yards are used as reservoirs to receive the excess production in summer and to furnish, on the approach of winter, the additional tonnage called for by the heavier demand at that season. It is noteworthy that they were established near points of greatest consumption, close to New York City and to the piers from which shipments were made by water to New England. Only one yard, and that of small capacity, was located in the anthracite region itself. To this type of storage belongs also the

[28] F. G. Tryon, *Consumers Stocks of Bituminous Coal, March 1 and June 1, 1920,* Report of Inquiry by U. S. Geological Survey in coöperation with U. S. Bituminous Coal Commission and Council of National Defense, p. 4, 11, 14, 17, Washington, 1920.

great system of docks at the head of Lakes Superior and Michigan, designed to accommodate both anthracite and bituminous coal, which constitutes probably the greatest storage plant for coal in the world. The docks are necessary because navigation on the Lakes must be completed between April 15 and December 10, and they exercise a beneficial influence on working time in the fields of the northern and middle Appalachians, which supply the Lake trade. To whatever extent similar storage facilities can be constructed elsewhere, the working time in other districts will be equalized. Experience suggests, however, that such intermediate storage is feasible only at some natural breaking point. To halt the loaded train halfway to its destination, store the coal, and later reload and transport it the remainder of the journey would be so expensive that the stored coal could not compete with that sent by through-shipment. The real objection to intermediate storage as a solution of the problem of irregular operation is that it does not guarantee a steady supply to the consumer, because the last link in the chain of transportation may fail at the critical moment. Thus, storage yards for bituminous coal in the vicinity of New York would have availed little to supply New England during recent periods of shortage, for the congestion in traffic through the gateways over the Hudson has on many occasions been the limiting factor in supplying New England. Not the least of the benefits of storage is the security it confers upon the consumer, and that security is not his until the coal is actually in his bin.

Storage at point of consumption. The true remedy for the seasonal fluctuation in the demand for coal is therefore storage at the place of use, which will insure the consumer against the menace of interruption to his line of communication with the mine. The magnitude of the task of storing enough coal to equalize the demand is not so great as might at first be supposed. We already habitually accumulate a considerable stock against winter requirements. If in addition to the present normal stock, 20,000,000 tons can be put in storage between March 1 and August 1, the task is done. It is urged that the expense of constructing new storage facilities would be prohibitive. The experience of the war indicates that the additional facilities required can somehow be found, for on the day the armistice was signed the total quantity of bituminous coal in commercial storage was at least 63,000,000 tons, and it is improbable that the normal stocks on November 11 exceed 40,000,000 tons.[28] Where the extra 23,000,000 tons was accommodated is something of a mystery to the coal fraternity. Clearly much of it was in emergency stock piles inadequately protected and inconveniently placed. The fact that it was accommodated somehow indicates, however, that the task of storing enough coal to equalize the de-

mand is by no means an impossible one. What was accomplished once by the consumer can be accomplished again, provided only that storage is made attractive to him.

Summer discount in prices. To interest the consumer some inducement in dollars and cents must be offered which will counterbalance the cost of storage. The most successful inducement in actual practice has been the summer discount in the price of anthracite, which was introduced by the railroad companies in the anthracite region in the year 1900. The maximum discount offered amounted to 50 cents a ton in the month of April, and was progressively reduced as the season advanced. It was some years after the summer discount was first offered before the working time in the anthracite region showed marked improvement, but since about 1910 the number of days lost per year has notably decreased, and the summer discount has no doubt contributed to that improvement.[29] Some of the leading producers in Oklahoma and Arkansas have followed the same practice for years with beneficial results.[30] Summer discounts on gas and domestic coals were also made by the Rhenish Westphalian Coal Syndicate, of Germany.[31] It should be noted, however, that summer differentials in mine prices are practicable only where competition is limited. If applied generally to sales of steam coal in the United States, the practice would involve the use of methods which would probably be construed to violate the anti-trust laws.

Sliding wage scale. One means of making possible seasonal differences in mine prices is a sliding wage scale that varies with the season.[32] The sliding scale that was introduced into the anthracite region in 1902 by direction of the Anthracite Coal Commission was not designed primarily to assist summer discounts in price, but it did in fact facilitate them.[33] Under this scale the wage rate was increased 1 per cent for every increase of 5 cents a ton in the price of anthracite at New York harbor, and decreased as the New York price declined, except that at no time was the wage rate to fall below a prescribed minimum. The sliding

[29] Smith and Tryon, *op. cit.*, p. 28.

[30] Communication from J. G. Puterbaugh, President, McAlester Fuel Company, McAlester, Okla.

[31] E. Gruner et G. Bousquet, *Atlas Générale des Houillères*, Part II, pp. 128-9. Summer discounts in price appear not to have been introduced until 1906, although the syndicate was organized in 1893. Two prices were announced, one for summer and one for winter, the differential amounting to about 10 per cent of the winter price.

[32] *Report of Coal Stabilization Committee of American Institute of Mining and Metallurgical Engineers*, Section 3 (d): *Mining and Metallurgy*, No. 186, p. 11, December, 1920.

[33] Anthracite Coal Strike Commission, *Report to the President on the Anthracite Coal Strike, May-October, 1902*, pp. 71-2, 1903.

wage scale was abandoned by agreement in 1912, but during the decade it was in force it no doubt assisted in maintaining the summer discounts in prices. As the mine laborers will benefit more than anyone else by a stabilization of working time it seems not unreasonable that part of the burden should be borne by them. Such a sliding scale would presuppose premiums during winter as well as reductions in spring and summer. The sliding wage scale has the further advantage that it could be adopted, provided both parties were agreed, by making it a feature of the wage contracts between the unions and the operators. This course would avoid violations of the anti-trust laws and would offer a means of regulating the seasonal demand that could be put into operation by the industry itself, without legislation.

Seasonal freight rates. The most promising measure to induce summer storage by the consumer which has so far been proposed in the United States is the establishment of seasonal freight rates on coal. A bill introduced into Congress by Senator Frelinghuysen in March, 1920, provided for graduated reductions in freight rates from February to July, and graduated increases from August to January.[34] The maximum spread between the highest and lowest months was 50 cents a ton. It was to be expected that the universal application of any change in coal freight rates would disturb established competitive relations between different fields and different types of coal, and this, it was shown, would be the probable effect of the Frelinghuysen plan. The bill was in general supported by operators in the Mississippi Valley and the Southwest and was opposed by the Appalachian shippers and by certain western producers, who thought that their coals, which are ill adapted to storage, would suffer by competition with the coals of other fields. No one set of differentials can be devised which will fit the business of all districts, for though in most fields there is a seasonal demand, the type curves of demand in the Appalachian region differ noticeably from those of the West. As drafted, the bill did not affect intra-state rates on coal, and it was pointed out that unless intra-state rates were swung into line with the differential rates on interstate business, the result would be confusion indeed. As the coal moving in strictly intra-state business constitutes 37 per cent of the total, exclusive of shipments to tidewater and the Lakes, the necessity of working out a harmonious set of differentials on all coal traffic is obvious, if the idea is to be applied at all.[35] These difficulties suggest that legislation intended to establish

[34] Senate Bill 4087, and Senate Bill 4278, 66th Congress, 1st Session. For discussion, see *Increased Price of Coal, Hearings before a Subcommittee of the Committee on Interstate Commerce,* 66th Congress, 1st Session, pursuant to S. Res. 126, Part 4, 1919.

[35] F. G. Tryon, *Seasonal Freight Rates Will Affect Coal Fields in Varying Degrees: Coal Age,* Vol. 17, p. 1033, May, 1920.

seasonal rates should be drawn only in the broadest terms, and that large discretionary powers should be vested in the Interstate Commerce Commission. If the application of the principle were made sufficiently elastic many of the objections raised by operators in particular fields could be avoided. The differentials proposed were probably sufficient to offer a real inducement to store coal. They were at least much in excess of the normal seasonal swing in spot prices in most districts. Of the remedial measures proposed the principle of seasonal rates appears to offer the greatest promise of affecting the seasonal demand for coal. Its chief advantage lies in the fact that it can be applied by statute without any fundamental change in the regime of competition to which the bituminous industry is at present committed.

A counter-proposal offered by the operators as a substitute for seasonal rates was a drawback or rebate on the freight charges paid on coal actually put in storage.[36]

Deflating Mine Capacity

It will be noted that most of the foregoing devices are designed to overcome the seasonal demand. If successful, their net effect would be to distribute the total annual output in twelve equal monthly installments. This result, desirable as it is from many points of view, would not of itself remove the present discrepancy between annual capacity and annual requirements. If an even distribution of demand could be effected at once it would increase the number of days worked in April only to decrease them in November, and the total number of days worked in the year would remain the same. We should still have an excess mine capacity of 250,000,000 tons and an excess labor force of 175,000 men.

The annual working time can be raised only by deflating the swollen mine capacity—the overdevelopment and overmanning of the mines. To what extent the evening up of demand would contribute to this deflation is problematical. It ought to minimize fluctuations in mine price and therefore to remove the periodic high spot prices, which have heretofore been one of the chief incentives to overdevelopment. Among its results should be fewer new mines and slower development of old mines. Its effect could at best be but gradual and negative, and a single return of a period of scarcity with its orgy of high prices, such as we experienced in 1920, would undo the work of years.

The truth is that the remedies so far proposed do not touch the fundamental fact of unlimited competition. They provide no positive way to check the growth of mine capacity. So long as there is no limit to the opening of new mines, our enormous reserves and our guarantee

[36] *Coal Age*, Vol. 17, No. 21, p. 1038, May 20, 1920.

that a new property shall get its share of the available transportation constitute a standing invitation to new enterprises, an invitation that needs only a tempting rise in the price of coal to find ready acceptance. There will remain also the pressure to open new mines in order to meet payments on investments in coal lands and the pressure to increase output in order to lower unit costs.

The necessity of some check on new development is shown by both of the two notable experiments in the stabilization of coal mining afforded by the history of the industry. The anthracite operators of Pennsylvania, by means of summer discount and storage, did succeed in eliminating seasonal fluctuations in production. At the same time, however, the small underground reserves of anthracite had set a natural limit beyond which development could not well proceed. The retardation of development enabled production—now equalized throughout the year —to overtake mine capacity. In 1918 the anthracite region averaged 293 working days, or almost theoretically full time. Even in 1919, a decidedly abnormal year, the working time was 266 days.[37]

In like manner the essential object of the German coal syndicate of Essen was to limit competition in overdevelopment and overproduction. The conditions leading to the formation of the syndicate—rapid development, overproduction, irregular demand, and sharp fluctuations in price—remind one strongly of the conditions in many coal fields of the United States today.

How far the industry itself can go in checking overdevelopment, in view of our present anti-trust laws, is a question. During the crowded four years from 1916 to 1920 forces have been at work which tend to a unification of policy and of interest. We hear of consolidations of strong companies within the same field; of acquisition by prosperous concerns in one field of properties in rival fields; of heavy investments in captive mines by industrial consumers and railroads. We have seen an increase in the number of operators' associations and in the work done by them, which culminated in the formation of the National Coal Association in 1917. The experience which the operators obtained during the war compelled them to get together and to adopt, for the time being at least, a national viewpoint. Not the least potent influence toward unification has been the prosperity attained during the war, which lifted the industry from a condition of near-insolvency and set it on its feet. This prosperity alone has provided a larger working capital and made possible the purchase of machines, improvements in mining practice, and a general improvement in technical efficiency.

But while these forces have been tending toward unified operation a set of opposing forces has been at work in the other direction. The

[37] U. S. Geological Survey, *Weekly Coal Report No. 169*, p. 7, October 9, 1920.

high prices and attractive profits and the magnitude of the war-time demand have resulted in an extraordinary enlargement of mine capacity. It is a question which of the opposing forces has made the greater headway. One fact is fairly clear. The tendency to combine has not gone far enough to squeeze out the water. The discrepancy between capacity and demand is probably greater now than it was in August, 1914.

Were the coal operators the only ones affected by the overdevelopment the public might with reason refuse to accept any responsibility in the matter, but after all it is the coal-consuming public that must pay for the whole expensive business. We must see our underground reserves depleted most wastefully, not because the operator is unaware of the loss, but because to him it is not waste but a response to the dictates of competition. We must pay the labor and capital engaged in coal mining, not only for the 215 days during which they work but for the 93 days during which they are idle. We must pay the railroads of the Middle West charges and depreciation on the coal cars that lie idle in summer. We hear talk of the social cost of universal military training. The number of men-days of enforced idleness in bituminous mining in the United States is equivalent to the loss of time involved in giving three months' military training to the year's class of all the young men in the country—truly a large price to pay for the blessings of competition in a single industry.

In thus outlining some of the evils of unlimited competition, the writer has ignored but not forgotten the problems which would be raised by the alternative. Combination in any form would probably necessitate fundamental readjustments of the public's relation to the coal business and would involve precedents of far-reaching significance, applicable to other industries. The discussion of what those readjustments should be, if any, is left to other and wiser students of the coal industry.